R E P O R T R E S U M E S

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AN EIGHT WEEK SUMMER INSTITUTE TRAINING PROGRAM TO RETRAIN OFFICE EDUCATION TEACHERS FOR TEACHING BUSINESS ELECTRONIC DATA PROCESSING.

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A 16-WEEK TWO-SUMMER INSTITUTE WAS HELD TO ASSIST IN DEVELOPING THE KNOWLEDGE AND SKILL ESSENTIAL FOR TEACHING SPECIALIZED COURSES IN A 2-YEAR CURRICULUM IN BUSINESS ELECTRONIC DATA PROCESSING. THE REPORT DESCRIBES THE INSTITUTE'S ENROLLMENT, ENVIRONMENT (AREA AND SCHOOL), TEACHING STAFF, TEXT MATERIAL, AND COURSE OUTLINES. EVALUATIONS BY BOTH THE INSTRUCTORS AND THE PARTICIPANTS INDICATED A CONFIDENCE IN HAVING GAINED THE NECESSARY KNOWLEDGE AND SKILL TO MEET THE REQUIREMENTS OF THEIR DATA PROCESSING TEACHING ASSIGNMENTS. (GD)

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AN EIGHT WEEK SUMMER INSTITUTE TRAINING PROGRAM TO RETRAIN OFFICE EDUCATION TEACHERS FOR TEACHING BUSINESS ELECTRONIC DATA PROCESSING

June 1, 1965 to December 31, 1965

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PROJECT AND OBJECTIVES

By general definition, business data processing consists of recording and reporting business information, whether it be as an individual, owners of business, or government agencies. In many cases pencil and paper are still used, but there has been a general trend for the need to use machines to attain goals in a more efficient way by relieving humans of routine clerical tasks.

Much of the routine work necessitated specific processing methods which started with the manual method, evolving into mechanical, and presently the electronic state. At this latter stage, human effort of a higher level of competence is considered more necessary than previously. Pressures exerted from without and from within organizations make the job of machine data processing a "must."

Due to "technological change" in the manufacturing and use of machines for data processing, the shortage of skilled personnel has become critical and best estimates indicate a growing demand.

Along with the shortage of skilled persons for the labor market, is the bigger shortages of instructional staffs to teach the techniques of machine data processing.

The general objective of this summer institute project was to assist in developing the knowledge and skill essential for teaching specialized courses in a two-year curriculum in business electronic data processing under the federally-supported Vocational and Technical Education Act.

Specific objectives included the development of self-confidence in techniques of machine wiring, operation and programming. In addition to this, hands-on skill, pedagogy and vocabulary were to be gained through group training and practice.

The complete institute consisted of sixteen weeks, two summers in length.

PROCEDURES

Enrollment

Applicants from a nine-state geographical area (North Dakota, Indiana, Minnesota, Illinois, Michigan, Iowa, Wisconsin, Ohio, Missouri) applied for admittance through their State Director of Vocational Education.

The criteria for selection of applicants included the following:

1. Bachelor degree in business mathematics, or equivalent; preferably with approximately one year of study in accounting.
2. At least three years of teaching experience or combination of teaching and work experience in the field of business or data processing; preferably in accounting, administration, mathematics, or business law.
3. Currently employed as a teacher or department chairman with teaching responsibilities in the field of business or data processing.

4. Available for a teaching assignment and capable of qualifying, at the completion of the institute, under the State plan as a teacher of business data processing in a curriculum designed to prepare computer programmers and application analysts.

5. Recommended for enrollment by State Director of Vocational Education in sending State.

A detail list of those attending the 1965 institute is shown in Exhibit I. Twenty-three attended the first eight-week session, eight attended the second eight-week session, and four participated in an experimental eight-week session, described later in this report under Results and Conclusions.

Successful completion of the institute courses may entitle the participant to degree or nondegree credit, depending upon the wishes and status of the participants in a degree program.

Environment - Area and School

Campus facilities were located in the central part of the city, easily accessible for living and transportation facilities. Transportation was furnished for off-campus activities, such as industry visitations.

Ample classroom space was provided for both lecture and study space. A separate, air conditioned machine laboratory, consisting of approximately 9,000 square feet was available on a continual supervised basis from 8 a.m. to 10 p.m. for instructional purposes only.

Laboratory machines included the following:

Desk adding machines and calculators.
Burroughs and NCR bookkeeping machines.
IBM key punch and verifiers.
IBM sorters, collators, interpreters, reproduce-summary punch and accounting machines.
IBM 1620 and 1401 digital computers.

NCR and UNIVAC machines were observed by actual demonstrations at plant visitations.

Films, visual aids, programmed learning devices, and guest speakers were in addition to regularly scheduled teacher contact hours.

Teaching Staff

Exhibit II lists teacher names and academic background. All teachers were full-time, regularly employed teachers of data processing at the Milwaukee Institute of Technology.

Text Material

See Exhibit III for list of texts and suggested text reference. Most machine manuals were furnished to participants without charge. In most cases, textbooks were furnished by the publisher without charge.

Course Outlines

Course outlines were specifically developed for this institute in preparation for the original summer institute held in 1963. (See Exhibit IV.)

In addition to receiving a copy of the summer institute outlines, participants were also furnished copies of outlines used in the regular two-year curriculum at the Milwaukee Institute of Technology. As a term project in the first eight-week session, each participant was required to develop visual aids and lecture notes to fit the course outline. Each student was further required to "practice teach" in presenting one lecture period to the class on some portion of the program.

The institute consisted of both first- and second-year courses, and the content was designed specifically to meet the needs of participants.

It was expected that the content of the courses in the institute evolved from, but was not necessarily limited to, the outlines of four specialized courses included in the first-year program and the outlines of the five specialized courses included in the second-year program of the suggested curriculum guide, "Electronic Data Processing--I," U.S. Office of Education, OE-80024. The programs consisted of subject matter content, as well as pedagogy.

First Year

C 102 Introduction to Business Data Processing - Study of the development of computer systems from manual methods to stored programs. Designed to provide a foundation for detailed study of specific systems.

C 105 Electric Accounting Machines - A survey of electric accounting machines, illustrating the need for machines in accounting and record keeping and the concept, power, and flexibility of the unit record. The importance and scope of unit record equipment as an independent system will be developed throughout the course. Laboratory exercises will be executed involving planning and wiring a range of unit record equipment. Practical exercises offered will be typical of those performed in the existing electric accounting machine installations.

C 122 Data Processing Applications - Designed to acquaint the participant with business data processing applications, practical case studies illustrate the use of data processing equipment in various types and sizes of representative companies.

C 124 Computer Programming 1 - Consideration of the function and capabilities of a specific data processing machine and the tools and raw materials necessary for becoming a programmer. Participant will perform programming drills, exercises, and case studies which will serve to bridge the gap from the theoretical to the real world of data processing.

Second Year (Planned primarily for participants who have completed first-year program.)

C 215 Computer Programming 2 - A continuation of the C 124 Computer Program 1 (see first-year program). The principles presented in the first year course will be employed repeatedly. Programming the tape data processing system will be taught as well as the fundamentals of random access programming.

C 213 Programming Systems - An introduction to programming systems to familiarize the student with the purpose and function of the various types of systems.

C 264 Business Systems Design and Development - Designed to guide the student through the three stages in the evoluation of a system, analysis of present information flow, information flow; system specifications and equipment selections and implementation of the system.

C 266 Advanced Programming Systems - Efforts will be made to provide the student with sufficient knowledge of programming systems concepts so that he may master any specific system with a minimum of instruction. Furthermore, he should be qualified to analyze, evaluate, and make minor modifications to such systems.

C 262 Data Processing Field Project - The project will consist of individual assignments related to a data processing installation. The primary purpose is to give an overview of practical data processing.

Academic Credit

Successful completion of the institute course entitled the participant to degree or nondegree credit, depending upon the status of the participant. Participants desiring college credit needed to request specific information from the director of the institution.

Participant daily contact hours consisted of the following:

1. First-year group - 8 hours

   a. Lecture - 4
      Lab - 4

2. Second-year group

   a. 8 hours first four weeks

      (1) Lecture - 4
          Lab - 4

   b. 4 hours second four weeks

      (1) Lecture - 2
          Lab - 2

3. Student spent afternoons of last four weeks in the following firms. One week with each firm.

   a. Allis Chalmers
   b. A. O. Smith
   c. General Merchandise Corporation (J. C. Penney)
   d. Northwestern Mutual Life Insurance Company

4. Outline for industry observation included:

   a. Programming
   b. Operations
   c. Control Methods and Techniques

5. Students talked with heads of various departments listed in three (a-d) above, as well as members of these departments. They also had an opportunity to observe what machines, people, etc., were doing in these departments.

Other features of the training included the following:

A. Assistance Received from Manufacturers and/or Employees

   1. Guest lecturers: 7 from Milwaukee industry
   2. Industry observation
   3. Tours
   4. Graduation banquet and speaker furnished by IBM. Banquet paid by IBM.

B. Seminars

   1. Burroughs Corporation
   2. Honeywell Corporation
   3. National Cash Register
   4. Fridens Office Machines
   5. IBM (Chicago Data Center)
   6. UNIVAC Corporation
   7. UARCO Business Forms Company
   8. Films and Visual Aids Demonstrations

C. Tours

   1. First Wisconsin National Bank (G. E. Equipment)
   2. Louis Allis Company (National Cash Register)
   3. A. O. Smith (IBM Equipment)
   4. General Merchandising Corporation (J. C. Penney) (IBM and National Cash Register)
   5. Pabst Brewing Company (IBM Equipment)
   6. Marshall and Ilsley Bank (IBM Equipment)
   7. Northwestern Mutual Life Insurance Company (IBM Equipment)
   8. Wisconsin Telephone Company (IBM Equipment)

D. Hand-Out Reproductions

1. Punch card and computer test problems
2. Data decks and solutions
3. Suggested unit lecture material and transparency masters
4. Ditto copies of all reports
5. Suggested text and reference books and course outlines

E. Special Features

1. Five programmed instruction machines from United States industries, including three films on computers, one film on math, and one film on scientific programming.
2. Programmed key punch course on magnetic tape.
3. Case study of: Becker Meat Packing Company, Lappin Electric Company, (inventory control).

   a. Completed a survey of both firms as part of Systems and Procedures of second-year program. Made recommendations for each company.

F. Equipment Used

1. IBM 403 Accounting Machine	082 Sorter	519 Reproducer
2. IBM 407 Accounting Machine	083 Sorter	1620 Computer
3. IBM 557 Interpreter	026 Key Punch	1622 card Read Punch
4. IBM 085 Collater	056 Verifier	1443 Printer
5. IBM 1401 Model G Computer	(2) Disk Pacs	

Other: National Cash Register Accounting Machines, Burroughs Sensimatic Accounting Machines with Key Punch Attachment. Thermofax and ditto copy machine.

RESULTS AND CONCLUSIONS

The objectives of the institute were completed. Eleven of the twelve participants satisfactorily completed the sixteen-week, two-summer, institute and are actively using their skill and knowledge gained during the institute in their present job assignments. They were awarded certificates of completion.

Twenty-three of the twenty-seven enrollees in the first year satisfactorily completed the eight-week institute and have been given new teaching assignments in Introductory Data Processing curriculums. Additional training is required to permit their advancement into second-year curriculum.

In conclusion, it is our opinion that the institute was very successful in meeting the objectives. The evaluations by both the instructors and the participants indicate a confidence in having gained the necessary knowledge and skill to meet the requirements of their data processing teaching assignments.

We recommend the continuation of the institutes until such time that comparable training is available at regular teacher training institutions, or schools of higher learning on a wide basis.

We further recommend that a study be made to measure the effectiveness of the training received by the participants and students being trained by those participants.

A next step should be the establishment of teacher job requirements in data processing in order to maintain and update the skills gained in this summer data processing training institute.

The eight-week time period is not considered to sufficiently provide adequate training for participants in all areas of EDP. Basic knowledge was developed and we have strongly urged further study, both formal and informal. We feel a third summer of institute-type study would be highly desirable due to the rapid pace of changes taking place.

Based on these beliefs we conducted an eight-week experimental workshop for five participants that completed sixteen weeks of the summer institute training. These five spent 90% of their available time in local industry data processing installations under controlled environment.

Results of this study, submitted to HEW under separate cover, were highly satisfactory from the standpoint of reinforcement and advancement of prior learning.

EXHIBIT I

SCHEDULE OF PARTICIPANTS 1965 BUSINESS DATA PROCESSING INSTITUTE

FIRST YEAR

Terry E. Berryman
Southeastern Indiana Area
Vocational School
Box 156
Versailles, Indiana

Merriman Bersch
Oshkosh Institute of Technical
Education
228 Algoma Boulevard
Oshkosh, Wisconsin

Richard Chamberlain
Lorain County Community College
128 O'Neil Sheffield Center
Lorain, Ohio

Gideon Frenkl
Kenosha Technical Institute
625 52 Street
Kenosha, Wisconsin

Robert Germer
School of Vocational Technical
and Adult Education
128 West Frederick Street
Rhinelander, Wisconsin

Robert L. Geske
Morton High School - West
2400 South Home Avenue
Berwyn, Illinois

Brother K. Gilbert, FSC
Hill High School
2051 East Larpenteur Avenue
St. Paul, Minnesota 55109

William Guess
Arsenal Technical High School
1500 East Michigan Street
Indianapolis, Indiana 46207

Arthur D. Harb
Racine Vocational Technical
and Adult School
800 Center Street
Racine, Wisconsin

*June Hayward
Milwaukee, Wisconsin

Wilma Jackson (Miss)
37 Blackburn Drive, Apt. 1
Belleville, Illinois

Manford L. Kistler
Danville Junior College
Fairchild at Jackson Streets
Danville, Illinois

Walter Klug
Waukesha Vocational Technical and
Adult School
222 Maple Avenue
Waukesha, Wisconsin

Merlin Jacobs
200 South Broadway
Green Bay, Wisconsin

Melvin L. Knodel
North Dakota State School of Science
Wahpeton, North Dakota

Edith May (Mrs.)
Vincennes University
Vincennes, Indiana 47591

*Duane W. McKay
Milwaukee, Wisconsin

Luella M. Norman
City-County Building
Room 1542
Indianapolis, Indiana 46204

Robert J. Nystrom
Holy Name High School
Escanaba, Michigan

Terrence Shea
721 Park Ridge Drive
Eau Claire, Wisconsin

*Milwaukee Vocational Technical and Adult Schools, 1015 North Sixth Street.

Leonard C. Stekiel
Pulaski High School
2500 West Oklahoma Avenue
Milwaukee, Wisconsin 53215

Brother Stephen, FSC
Cretin High School
495 South Hamline Avenue
St. Paul, Minnesota 55116

Loren J. Swedelius
North High School
2520 East 12 Avenue
North St. Paul, Minnesota 55109

James A. Urness
Wausau Technical Institute
River Drive
Wausau, Wisconsin

*John Wargin
Milwaukee, Wisconsin 53203

Virginia G. Williams (Miss)
School of Business and Industry
St. Cloud State College
St. Cloud, Minnesota

Floyd Zwieg
Muskeko High School
S87 W18431 Woods Road
Muskego, Wisconsin 53150

SECOND YEAR

Douglas Benn
Kenosha Technical Institute
625 52 Street
Kenosha, Wisconsin

Robert E. Davenport
Des Moines Technical High School
1800 Grand Avenue
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James F. Dowis
Des Moines Technical Institute
1800 Grand Avenue
Des Moines, Iowa

Arvin W. Fettkether
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Roland Herzig
Vocational Technical and Adult
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Donald M. Kruger
Northern Michigan University
Area Training Center
107 Main Street
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Betty J. Miller
702 Sunset Drive
Indianola, Iowa

James P. Ollila
Northern Michigan University
Area Training Center
107 Main Street
Marquette, Michigan

*Gilbert Paradowski
Milwaukee, Wisconsin

Robert Reynolds
Green Bay, Wisconsin

Gene P. Rogers
Des Moines Technical Institute
1800 Grand Avenue
Des Moines, Iowa

Jack Smythe
State Board of Vocational and Adult
Education
1 West Wilson Street
Madison, Wisconsin 53702

*Milwaukee Vocational Technical and Adult Schools, 1015 North Sixth Street.

EXHIBIT II

TEACHING STAFF

Business Instructors

1. Richard Tibbits, B.S., CDP, Chairman, Business Data Processing Department
2. Eugene Maurer, B.B.A., CDP, Instructor, Business Data Processing Department
3. Royce Mensink, B.A., B.S., CDP, Instructor, Business Data Processing Department
4. Robert Holzbach, B.S.M.E., MBA, Instructor, Business Data Processing Department
5. Roger Boese, Lab Assistant, Business Data Processing Department
6. Jerome Monfre, Lab Assistant, Business Data Processing Department

EXHIBIT III

TEXT MATERIAL

Required books and supplies must be purchased in advance on an individual basis. Normal student class material such as note paper, pencils, pens, erasers, and IBM block diagram template are the only supplies needed.

The following list of text material will be necessary for lecture-lab. use. IBM manuals indicated with an * are normally furnished free of charge to instructors through local IBM sales offices. Please try to arrange for these in advance.

The following is a minimum list of texts required. Every attempt was made to keep purchases at a minimum. Several other texts will be available for reference:

"Computer Arithmetic" by Henry Jacobowitz, 1962, John F. Rider Publisher, Inc., New York.

"Systems and Procedures for Automated Accounting," 1962, by Randall, Weimer, Greenfield, Southwestern Publishing Company.

"Computers" by Stanley Englebardt, 1962, Pyramid Publications.

"IBM Machine Operation and Wiring" by Lawrence Salmon, 1962, Wadworth Publishing Company.

"Programming the IBM 1620" by C. B. Germain, 1962, Prentice-Hall Publishing Company.

*IBM 407 Accounting Machine (A24-1011-1)
* Functional Wiring Principles (A24-1007)
* Introduction to IBM Data Processing Systems (F22-6517)
* Flow Charting and Block Diagram Techniques (C20-8008)
* 1620/1710 Symbolic Program Systems (C26-5600-5)
* 1620 Reference Manual (A26-4500-2)

EXHIBIT IV

Milwaukee Institute of Technology - Summer Institute I

BUSINESS DATA PROCESSING - COURSE OUTLINE

ELECTRIC ACCOUNTING MACHINES	TEACHING METHODS
Division I The Unit Record	
A. Card Format and Code (Transcripted Record)	Lecture
B. Control Punches (Zones for Alpha) x + 12 Punch Control	Transparencies Chalk Board
C. Card Field Arrangement	
D. Flexibility in Processing	
E. Card Handling - Joggling and Fenning	Demonstration
Division II Processing Concepts	
A. Recording	Lecture
B. Classifying	Demonstration of Forms
C. Calculating	
D. Report Preparation (Summarizing)	
Division III Elements of a Machine	
A. Card Feeding and Reading	Lecture, Transparencies and Visual Demonstrations
B. Printing Units and Counters	
C. The Control Panel	
Division IV The Card Punch and Verifier	
A. Functions and Features	Lecture Chalk Board Transparencies Demonstration Laboratory Problems
B. Alphabetic and Numeric Punching	
C. Explicating	
D. The Control Card or Program Drum Card	
E. Verification	
Division V Interpreter	Lecture Chalk Board Transparencies Demonstration Control Panel Laboratory Problems
A. Functions and Features	
B. Column Splits and Selectors	
C. Interpreting with Selection	
Division VI Sorter	Lecture Chalk Board Transparencies Demonstration Control Panel Laboratory Problems
A. Features and Speeds	
B. Principles and Operating Procedures	
C. Numeric and Alphabetic Sorting	
D. Block Sorting	
Division VII Reproducing Punch	Lecture Chalk Board Transparencies Demonstration Control Panel Laboratory Problems
A. Functions and Features	
B. Operating Procedures	
C. Reproducing and Gangpunching	
D. Comparing and Verifying	

Division VIII Collator	
A. Functions and Features	Lecture
B. Operating Procedures	Chalk Board
C. Sequence Checking	Transparencies
D. Merging, Matching, and Match Merging	Demonstration
E. Selection	Control Panel
	Laboratory Problems
Division IX Tabulators - Accounting Machines	
	Lecture
A. Functions and Features	Chalk Board
B. Control Panel	Transparencies
1. Detail Printing	Lecture
2. Program Control	Chalk Board
3. Addition and Subtraction - Counter Control	Control Panel
4. Group Printing and Group Indication, Comparing	Demonstration
5. Selective Printing	Laboratory Problems
6. Summary Punching	
Division X Calculators and Other Punch Card Machines	Lecture
	Chalk Board
A. Functions and Features	Planning Chart

DATA PROCESSING APPLICATIONS	TEACHING METHODS
I. Billing	
A. Types - Cycle - Prebilling - Order Writing	Lecture
B. Procedures - Flow Charts - Editing	Demonstration
C. Controls (from hand system through machine systems)	Flow Chart Problem
D. Basis for Sales Analysis System	
II. Accounts Receivable	
A. Theory, Concepts, Objectives and Relationships	Lecture
B. Open Item Approach vs. Balance Forward	Demonstration
C. Payments Procedures - Updating - Credit Information - Statements - Aging Reports - Other Reports	Bookkeeping Machines
D. Mechanized Systems - Comparisons	
III. Accounts Payable	
A. Theory, Concepts, and Functions	Lecture
B. Establishing and Validating Liability	Demonstration
C. Posting and Check Writing Procedures	Bookkeeping Machines
D. Distribution and Controls	
E. Discounts - Trade-Cash - Anticipation	
F. Variety and Advantages of Machine System	

IV. Payroll	
A. Theory, Concepts and Relationships	Lecture
B. Types of Payroll and Documents Involved	Demonstration
C. Methods of Computation and Compiling	
D. Machine Payroll Writing	
E. Governmental Requirements - Controls	Flow Chart
V. Payroll Distribution	
A. Accounting and Management Requirements	Lecture
B. Cost Analysis - Efficiency Reports	Demonstration
C. Relationship to Production Control	Flow Chart
VI. Inventory Control	
A. Theory and Concepts	Lecture
B. Inventory Systems	Demonstration
C. Controls - Coding - Procedural Approaches	Flow Chart
D. Mechanization	
E. Physical Inventory Pricing	
VII. Production Control	
A. Relationship to Inventory and Engineering	Lecture
B. Functions and Procedures	Demonstration
C. Dependence upon Forecasting	Flow Chart
D. Information Control	

Emphasis was placed on the interrelationship of the above applications. Further emphasis was placed on the value of management reports obtainable as a result of placing certain volume applications on punched cards. Control panel wiring was required as laboratory practice on all machines other than the calculator.

INTRODUCTION TO COMPUTER PROGRAMMING

TEACHING METHODS

Division I Development of Electronic DP Systems

Lecture
Film
Overhead Transparency

A. Evolution from Manual to Computer Methods

1. Highlights of Data Processing Development
2. Manual Methods through Key Driven Machines
3. Brief Overview of Punched Card Systems
4. The Need for Electronic DP Systems

B. The Business Organization and DP

1. Function of Business
2. The Organization Chart

a. The Company
b. The DP Unit

3. The Nine Key Operation
4. Forms - Flow Chart
5. Procedures - Flow

Division II Computer Characteristics

A. Components of Systems

Lecture
Demonstration
Chalk Board

1. Stored Programs
2. Elements of Problem Solving
3. Central Processing Unit

a. Cards
b. Paper Tape
c. Magnetic Tape
d. Magnetic Character Sensing
e. Optical Reader
f. Printers
g. Random Access Devices

5. Primary Storage
6. Arithmetic Unit
7. Logic Ability
8. Documentation

B. Types of Systems	Lecture Film
1. Large, Medium, Small Scale	
2. Commercial, Scientific, Mixed	
3. Analog and Digital	
4. Serial and Parallel	
5. Buffered and Unbuffered	
6. Sequential and Nonsequential	
7. Numeric and Alphanumeric	
8. Variable and Fixed	
9. An Integrated DP System	
C. Digital Data Representation	
1. Bit Configurations	
Division III Internal Processing	Lecture Demonstration Problem
A. Loading the Stored Program	
B. Accessing	
C. Registers	
D. Data Flow	
Division IV The Number Systems	Lecture
A. Base 10 Numbering System	
B. Rational and Irrational Numbers	
C. Powers and Roots	
D. Logarithms	
Division V Representation of a Number with an Arbitrary Base	Lecture
A. Binary	
B. Octal	
C. Conversion from One Base to Another	
Division VI Fixed and Floating Point Numbers	Lecture
A. Fixed Point	
1. Scaling	
2. Advantages	
B. Floating Point	
1. Mantissa	
2. Exponent	
3. Advantages	

Division VII Elements of Problem Solving	Lecture Demonstration
A. Problem Definition and Organization B. Procedure Development C. Block Diagramming D. Stored Program Concepts	
Division VIII Instructions and Data Flow - 1620 Card System	Lecture Demonstration Problems
A. Format Control Codes B. Card System Input/Output Instructions C. Data Movement Instructions D. Arithmetic E. Branching F. Logic Instructions G. Miscellaneous Codes	
Division IX Programming Systems	Lecture Demonstration
A. Computer Languages 1. Fortran 2. COBOL B. Compilers C. Utility Programs D. 1401 Computer System	

EXHIBIT IV

Milwaukee Institute of Technology - Summer Institute II

BUSINESS DATA PROCESSING - COURSE OUTLINE

ADVANCED COMPUTER PROGRAMMING	TEACHING METHODS
Division I Programming a Tape System	
A. Characteristics of Magnetic Tape Drive Units	Lecture Slides
1. Low Density Tape Drives 2. Hyper Density Tape Drives	Sample Tape Tape Reel
B. Organization of Tape Data	Slides - Enlarged Picture of Tape Records
1. Unit Record Storage 2. Blocked Record Storage 3. Tape Labeling	
C. Tape I/O Program Instructions	Discuss Sample Program AP 1 and 2
D. Macro-Report Generator and Utility Programs	Individual Lab Assignment Handout-Suggested Procedure and Result
E. Case Problem - Tape Program	
Division II Programming a Random Access Device	
A. Characteristics of the IBM 1620-1311 B. Organization of Disk Storage C. Monitors and Supervisory Programming Systems D. Case Problem - Disk Program	Lecture Slides Machine Demonstration Discuss Sample Program AP 3, 4, and 5. Lab. Assignment
Division III COBOL Programming System	
A. Development of the COBOL Language	Lecture Slides
B. Divisions of COBOL	Sample Programs Compare to English Language Structure
1. Data Division 2. Procedure Division 3. Environment Division 4. Identification Division	
C. Program Coding Methods	Flip Chart COBOL Film
1. Code Source Documents 2. Program Assembly Process 3. Program Correction	Compare with Seminar - Tour 3

Division IV FORTRAN Programming for Business

A. Basic FORTRAN Review — Slides - Discuss Program

1. FORTRAN Programming Rules
2. FORTRAN Exercise

B. Mixing Programming Languages — Slides - Discuss Program and Assign Lab. Problem

1. Program Exercise

Division V Computer Applications and Simulations

A. Critical Path Scheduling — PERT Film, Guest Lecturer

B. Management Games — Assign Teams and Execute Partial Operating Business Cycle

1. Operation of Game
2. Use of Game Results
3. Materials Required

COMPUTER UTILIZATION — TEACHING METHODS

The purpose of this course was to permit guided application of knowledge gained in the total area of data processing. Specific individual and group assignments were designed to reinforce technical knowledge of punch card, computer, and programming needs. It was further designed to develop and broaden the concepts of systems and procedures for business management.

Division I Manufacturing Order Writing Application — Lecture, Demonstration, Lab Problem

Division II Manufacturing Billing Application

Division III Manufacturing Sales Analysis Application

Division IV Manufacturing General Ledger Application

Division V Integrated Computer System of Manufacturing Order Writing, Billing, Sales, and General Ledger Applications

SYSTEM AND DESIGN PROCEDURES FOR BUSINESS — TEACHING METHODS

Division I History of Business Systems

A. The Growth and Changing Role of Clerical Operations — Lecture and Film Clarify Terminology

1. Clerical Factory Operations
2. Clerical Office Operations

Division II Planning and Systems Concepts

A. Organization and Systems Concepts
B. Control and Systems Concepts
C. Integration of Systems Concepts

Division III Modern Role of Business Systems	
A. Management Science	Lecture, Films, Seminar Guest Lecturer
1. Problem Solving	
2. Scientific Method	
3. Mathematical Analysis Models	
4. Simulation	
B. People and Systems	
C. Systems Management in the Future	
Division IV Developing a System	
A. The Approach to Systems Development	
B. Requirements of Systems Implementation	
C. Methods of System Control	
1. Definition and Elements of Control	
2. Relationship and Examples of System Controls	
Division V Systems Implementation and Integration	
A. Means and Need for Systems Integration	Lecture Demonstration
B. Responsibility for Systems Maintenance	
C. Postinstallation Evaluation of System	
Division VI Systems Project Review	Review and Summarize Knowledge Gained from Project Assignment